Paper 55-27

Summarizing Data with Base SAS® PROCs

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ABSTRACT
Base SAS provides a number of procedures designed to aid the SAS user in developing data summary reports. These procedures include MEANS, UNIVARIATE, FREQ, REPORT and TABULATE. Additionally, PROC FORMAT is also available to modify the appearance of data values or combine values into desired categories within PROCs without changing actual data values or creating new variables.

This presentation explores various common types of summary reports and what factors you should consider in deciding which procedure is best suited to your reporting needs. It is not meant to be a detailed tutorial on PROC step programming code for all of these procedures, but rather a guide on how to decide which procedures fits the requirements for a given report.

Summary reports generated using Base SAS PROCs are presented along with the code producing these reports. These examples are valid with SAS Versions 6-8.

INTRODUCTION
Base SAS has a number of procedures to help you report your data in the form you would like to see it presented. In deciding which procedure is most appropriate for your needs, you must consider a number of factors. These factors include the following.

- What is the purpose of the summary?
- What information do you need in the report?
- Do you need a specific layout or customized information?
- Do you need cross-tabulations or hierarchical groupings?
- Do you need statistics?

We will consider each of these items to see which PROC(s) will let you produce the desired report most easily. All of the procedures discussed in this paper are available in Base SAS. Output from the code given in this paper is shown in the Appendix. (Note: Tables 3 through 6 only include the last page of output generated by these procedures.)

WHAT IS THE PURPOSE OF THE REPORT?
Do you need a detail or a summary report? A detail report gives you at least one row of information in your report for every observation in the data set (assuming you are not using a WHERE statement in the procedure to limit which observations are processed). A summary report generally does some form of collapsing of observations so that each row in the report represents information from more than one observation.

Some of the most frequently used Base SAS procedures for reporting and summarizing data include the following.

- PRINT – Produces a detail report, although this can include summary information overall and/or within subgroups. PRINT can also produce a summary report if the data has been outputted to a summary data set through another procedure.

- MEANS/SUMMARY - Produces summary statistics, by default number of observations, mean, standard deviation, minimum, and maximum.

- UNIVARIATE - Produces the above statistics, plus a number of other statistics including median, mode, percentiles and the five lowest and highest values.

- FREQ – Generates counts and percentages for one-way and two-way tables; performs statistical tests on frequency data.

- TABULATE – Produces one, two and three-way summary tables with selected summary statistics.

- REPORT - Produces detail or summary reports with selected summary statistics; allows a great deal of flexibility in customizing reports.

One procedure that does not produce a report itself, but is often essential to producing customized reports is PROC FORMAT. Although SAS provides a multitude of SAS-defined formats, quite often a format is needed that is not available. PROC FORMAT allows you to create user-defined formats. In this study, we would like to see the GENDER and NRACE variables printed with user-defined formats. Note that it is a two-step process. First the format must be created; then the format must be assigned to the appropriate variable(s).

The following code sets up the formats for selected variables and uses PROC DATASETS to display the descriptor portion of the permanent SAS data set BTPAPER.MBP.

```
LIBNAME BTPAPER 'C:\SAS\BTPAPER';

OPTIONS LINESIZE=142 PAGESIZE=42 NODATE NONUMBER;

PROC FORMAT;
  VALUE $GENDER
        'M'='Male'
        'F'='Female';
  VALUE $RACE
        '1'='White'
        '2'='Black'
        '3'='Oriental'
        '4'='Other';
  VALUE $RCODE
    '001'='Baseline DBP > 90, decreased by 10% or more'
    '002'='Baseline DBP > 90, decreased by 5% up to 10%'
    '003'='Baseline DBP > 90, decreased by 0% up to 5%'
    '004'='Baseline DBP > 90, increased'
    '005'='Baseline DBP <= 90';
  VALUE NCENTER
        1='Dr. Green'
        2='Dr. Jones'
        3='Dr. Wright';
RUN;

DATA BTPAPER.MBP;
 SET BTPAPER.MBP;
 FORMAT NRACE $RACE. GENDER $GENDER.;
RUN;

**** CONTENTS OF ORIGINAL DATA SET ****;
**** BTPAPER.MBP (TABLE 1) ****;

PROC DATASETS LIB=BTPAPER;
 CONTENTS DATA=MBP;
 TITLE1 'TABLE 1';
 TITLE2 'CONTENTS OF BTPAPER.MBP DATA SET';
RUN;
```

Appendix Table 1 shows the six demographic and diastolic blood pressure variables present in the original data set, BTPAPER.MBP.

When the purpose of the report is primarily to produce summary reports to be used for data cleaning, such as checking for outliers or looking for missing or miscoded values, the most commonly used procedures are PROC PRINT for detail reports and PROC MEANS, PROC UNIVARIATE and PROC FREQ for summary reports. These procedures are also often used to produce preliminary or "ad hoc" reports. The following code uses PROC FREQ to produce a two-way summary tables with the frequencies of GENDER by NRACE combinations.

```
**** PROC FREQ FOR BTPAPER.MBP ****;
**** SUMMARY REPORT (TABLE 2) ****;

PROC FREQ DATA=BTPAPER.MBP;
 TABLES GENDER*NRACE;
 TITLE1 'TABLE 2';
 TITLE2
 'PROC FREQ OF BTPAPER.MBP – SUMMARY REPORT';
RUN;
```

Output from this code is shown in Appendix Table 2. Results from using PROC MEANS are shown in a later example.

PROC TABULATE and PROC REPORT are the real "work-horses" of customized report writing. Both of these procedures produce summary reports, while PROC REPORT can also generate detail reports. Examples of both of these procedures are discussed in later sections.

WHAT DATA DO YOU NEED IN THE REPORT?

Do you need additional columns of information in the report that do not already exist as variables in the data set? An example of this might be the sum or average of two existing variables in the data set. If that information is only necessary for the report, why go through an additional DATA step to create a new variable? PROC REPORT will allow you to create new columns of information within the PROC step.

If you need the same information represented in more than one way in a report (for example, a medical code represented as a coded value in the data set as well as an interpreted or formatted value), then PROC REPORT will allow you to show both columns in the same report. PROC PRINT will also do this, but requires that you create a new variable in the DATA step. (It will not print the same variable with two different formats in the same report.) Using PROC FORMAT to create a format to associate with the coded value in conjunction with PROC REPORT will allow you to use both the coded and formatted value in the same report without creating a new variable.

The following code creates a temporary data set, WORK.MBP2 which includes the newly created variable CSTDIAM (Change in Diastolic Blood Pressure) as well as the six variables present in the original BTPAPER.MBP data set.

```
**** CREATING WORK DATA SET MBP2 ****;

DATA MBP2;
 SET BTPAPER.MBP;
 CSTDIAM=STDIAM-BSTDIAM;
 LABEL CSTDIAM='Change in Diastolic BP';
RUN;
```

Tables 3 and 4 present detail reports using PROC PRINT and PROC REPORT, respectively. Table 4 includes two additional columns of information generated with PROC REPORT. The Physician Name column is created based on the value for CENTER, and Change in Diastolic Blood Pressure is computed with a COMPUTE block. The code that generated Table 4 also creates a new data set called WORK.NEWMBP which includes

the newly computed variables. The following code produces Appendix Tables 3 and 4.

```
**** PROC PRINT FOR WORK.MBP2 ****;
**** DETAIL REPORT (TABLE 3) ****;

PROC PRINT DATA=MBP2 SPLIT='/' NOOBS;
 VAR PTNO CENTER NRACE GENDER
     BSTDIAM STDIAM CSTDIAM;
 FORMAT NRACE $RACE. GENDER $GENDER.;
 LABEL PTNO='Patient/Number'
      CENTER='Center'
      NRACE='Race'
      GENDER='Gender'
      BSTDIAM='Baseline/Diastolic/BP'
      STDIAM='Final/Diastolic/BP'
      CSTDIAM='Change in/Diastolic/BP';
 TITLE1 'TABLE 3';
 TITLE2
 'PROC PRINT OF WORK.MBP2 - DETAIL REPORT';
RUN;

**** PROC REPORT FOR BTPAPER.MBP ****;
**** DETAIL REPORT (TABLE 4) ****;
**** CREATES OUTPUT DATA SET WORK.NEWMBP ****;

PROC REPORT DATA=BTPAPER.MBP NOWD
      HEADSKIP SPACING=3 OUT=NEWMBP;
  COLUMN PTNO CENTER CENTER=NCENTER NRACE
      GENDER BSTDIAM STDIAM CSTDIAM;
   DEFINE PTNO/DISPLAY WIDTH=7 FORMAT=3.
      CENTER 'Patient Number';
   DEFINE CENTER/DISPLAY WIDTH=6 FORMAT=1.
      CENTER 'Center';
   DEFINE NCENTER/WIDTH=10 FORMAT=NCENTER.
      CENTER 'Physician Name';
   DEFINE NRACE/DISPLAY WIDTH=9 CENTER
       FORMAT=$RACE. 'Race';
   DEFINE GENDER/DISPLAY WIDTH=6 FORMAT=$GENDER.
      'Gender';
   DEFINE BSTDIAM/ANALYSIS MEAN WIDTH=9
      FORMAT=3. CENTER SPACING=5
      'Baseline/Diastolic/BP';
   DEFINE STDIAM/ANALYSIS MEAN WIDTH=9 FORMAT=3.
      CENTER 'Final/Diastolic/BP';
   DEFINE CSTDIAM/COMPUTED WIDTH=9 FORMAT=3.
      CENTER 'Change in/Diastolic/BP';
 COMPUTE CSTDIAM;
  CSTDIAM=STDIAM.MEAN-BSTDIAM.MEAN;
 ENDCOMP;
 TITLE1 'TABLE 4';
 TITLE2
 'PROC REPORT OF BTPAPER.MBP - DETAIL REPORT';
RUN;
```

DO YOU NEED A SPECIFIC LAYOUT OR CUSTOMIZED INFORMATION?

This could include, but is not limited to the following:

- providing customized information for subgroups or at the beginning or end of a report,
- underlining column headers,
- allowing variable values to extend across more than one line.

When developing a detail report, the simplest option you should consider is PROC PRINT. If you need sums for subgroups or at the end of a report, PROC PRINT will give these to you. However, if in addition to or instead of sums, you need other statistics or information (which can include customized text), then PROC REPORT is probably the more appropriate approach. Also, if you need to underline the column headers or you have variable values that will extend past the page width (based on the number of variables you are trying to print and the PAGESIZE= option), then PROC REPORT will provide these capabilities.

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Appendix Tables 5 and 6 present detail tables, although Table 6 also includes summary information. Table 5 uses PROC PRINT to produce a detail report on WORK.MBP3 (which is created in a data step below from WORK.MBP2 so that the physician name and comment variables are available for printing).   PROC REPORT was used to generate Table 6. In this table the column headers are underlined, the comment variable values can extend across multiple lines, and customized text with summary statistics are provided overall and for each center. The following code produces these tables.

```
**** CREATING DATA SET WORK.MPB3 ****;
**** AND PROC PRINT OF WORK.MBP3 ****;
**** DETAIL REPORT (TABLE 5) ****;

DATA MBP3; SET MBP2;
 LENGTH COMMENT $ 3;
 NCENTER=CENTER;
 RATIO=CSTDIAM/BSTDIAM;
 IF BSTDIAM GT 90 THEN DO;
  IF RATIO NE . AND RATIO LE -.10
     THEN COMMENT='001';
    ELSE IF -.10 LT RATIO LE -.05
     THEN COMMENT='002';
    ELSE IF -.05 LT RATIO LE 0
     THEN COMMENT='003';
    ELSE IF RATIO GT 0 THEN COMMENT='004';
 END;
 ELSE IF BSTDIAM LE 90 THEN COMMENT='005';
 FORMAT NCENTER NCENTER. COMMENT $RCODE.;
RUN;

PROC SORT DATA=MBP3;
 BY CENTER NCENTER;
RUN;

PROC PRINT DATA=MBP3 SPLIT='/' NOOBS;
 ID CENTER NCENTER;
 BY CENTER NCENTER;
 VAR PTNO NRACE GENDER BSTDIAM
     STDIAM CSTDIAM COMMENT;
 FORMAT NRACE $RACE. GENDER $GENDER.;
 LABEL PTNO='Patient/Number'
       CENTER='Center'
       NRACE='Race'
       GENDER='Gender'
       COMMENT='Comment'
       NCENTER='Physician/Name'
       BSTDIAM='Baseline/Diastolic/BP'
       STDIAM='Final/Diastolic/BP'
       CSTDIAM='Change in/Diastolic/BP';
 TITLE1 'TABLE 5';
 TITLE2
  'PROC PRINT OF WORK.MBP3 - DETAIL REPORT';
RUN;

**** PROC REPORT FOR BTPAPER.MBP ****;
**** WITH SUMMARY INFORMATION ****;
**** DETAIL REPORT (TABLE 6) ****;

PROC REPORT DATA=BTPAPER.MBP NOWD
            HEADSKIP HEADLINE SPACING=3;
 COLUMN CENTER CENTER=NCENTER PTNO NRACE GENDER
     BSTDIAM STDIAM CSTDIAM COMMENT;
  DEFINE PTNO/DISPLAY WIDTH=7 FORMAT=3.
      CENTER 'Patient Number';
  DEFINE CENTER/ORDER WIDTH=6 FORMAT=1.
      CENTER 'Center';
  DEFINE NCENTER/ORDER WIDTH=10 FORMAT=NCENTER.
       'Physician Name';
  DEFINE NRACE/DISPLAY WIDTH=9 CENTER
      FORMAT=$RACE. 'Race';
  DEFINE GENDER/DISPLAY WIDTH=6 FORMAT=$GENDER.
      'Gender';
  DEFINE BSTDIAM/ANALYSIS MEAN WIDTH=9 FORMAT=3.
      CENTER SPACING=5 'Baseline/Diastolic/BP';
  DEFINE STDIAM/ANALYSIS MEAN WIDTH=9 FORMAT=3.
      CENTER 'Final/Diastolic/BP';
  DEFINE CSTDIAM/COMPUTED WIDTH=9 FORMAT=3.
      CENTER 'Change in/Diastolic/BP';
```

```
  DEFINE COMMENT/COMPUTED WIDTH=25 SPACING=5
      FLOW FORMAT=$RCODE. 'Comment';

 COMPUTE CSTDIAM;
  CSTDIAM=STDIAM.MEAN-BSTDIAM.MEAN;
 ENDCOMP;

 COMPUTE COMMENT/CHARACTER;
  IF BSTDIAM.MEAN GT 90 AND
     (CSTDIAM/BSTDIAM.MEAN) LE -.10
       THEN COMMENT='001';
  ELSE IF BSTDIAM.MEAN GT 90 AND
     -.10 LT (CSTDIAM/BSTDIAM.MEAN) LE -.05
       THEN COMMENT='002';
  ELSE IF BSTDIAM.MEAN GT 90 AND
     -.05 LT (CSTDIAM/BSTDIAM.MEAN) LE 0
       THEN COMMENT='003';
  ELSE IF BSTDIAM.MEAN GT 90 AND
     (CSTDIAM/BSTDIAM.MEAN) GT 0
       THEN COMMENT='004';
  ELSE IF BSTDIAM.MEAN LE 90 THEN COMMENT='005';
 ENDCOMP;

 BREAK AFTER CENTER/SKIP;
 COMPUTE AFTER CENTER;
  PCHANGE=(CSTDIAM/BSTDIAM.MEAN)*100;
  LINE @3 ' ';
  LINE @22 111*'-';
  LINE @22
    '|The average change in diastolic blood'
    @61 'pressure for'
    @74 CENTER NCENTER. @85 'was'
    @89 CSTDIAM 6.2
    @96 'with an average % change of'
    @124 PCHANGE 7.2 @132 '|';
  LINE @22 111*'-';
  LINE @3 ' ';
 ENDCOMP;

 RBREAK AFTER/SKIP;
 COMPUTE AFTER;
  PCHANGE=(CSTDIAM/BSTDIAM.MEAN)*100;
  LINE @3 ' ';
  LINE @22 103*'=';
  LINE @22
    '|The average change in diastolic blood'
    @61 'pressure overall'
    @78 'was' @82 CSTDIAM 6.2
    @89 'with an average % change of'
    @116 PCHANGE 7.2 @124 '|';
  LINE @22 103*'=';
  LINE @3 ' ';
 ENDCOMP;
 TITLE1 'TABLE 6';
 TITLE2
   'PROC REPORT OF BTPAPER.MBP - DETAIL REPORT';
RUN;
```

DO YOU NEED CROSS-TABULATIONS OR HIERARCHICAL GROUPINGS?
Both of these types of tables are summary reports where you display some sort of statistic(s) within a combination of variable values in either the row and/or column dimensions. As we have seen earlier, PROC FREQ can produce cross-tab tables. PROC PRINT can also produce this type of report after outputting the summary information from some other procedure. However, this type of report is usually generated with PROC TABULATE or PROC REPORT because of the greater flexibility and need for fewer steps.

Appendix Tables 8, 9 and 10 all show the diastolic blood pressure summarized by demographic data. Table 8 provides the same information as the other tables, but may not be as desirable for reporting purposes. It also requires that the data be outputted with PROC MEANS or SUMMARY as shown in Table 7. Tables 9 and 10 produce very similar reports. Table 9 (PROC TABULATE) requires less programming code, while Table 10 (PROC REPORT) allows more flexibility in spacing between columns of information,

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underlining of headers, and customized text (if desired). The following code generates Appendix Tables 7, 8, 9 and 10.

```
**** PROC MEANS FOR WORK.MBP2 ****;
**** TO CREATE NEWMBP2 ****;
**** SUMMARY REPORT (TABLE 7) ****;

PROC MEANS DATA=MBP2 MAXDEC=2 /*NOPRINT*/;
 CLASS GENDER NRACE;
 VAR BSTDIAM STDIAM CSTDIAM;
 OUTPUT OUT=NEWMBP2 N=BSTDIAM STDIAM CSTDIAM
                    MEAN=MEANBST MEANST CMEANST
                    STD=STDBST STDST CSTDST;
 TITLE1 'TABLE 7';
 TITLE2
    'PROC MEANS OF WORK.MBP2';
 TITLE3 'SUMMARY REPORT';
RUN;

PROC PRINT DATA=NEWMBP2 LABEL NOOBS;
 VAR GENDER NRACE _TYPE_ BSTDIAM MEANBST STDBST
     STDIAM MEANST STDST CSTDIAM CMEANST CSTDST;
 FORMAT MEANBST MEANST CMEANST
     STDBST STDST CSTDST 8.2;
 LABEL BSTDIAM='Baseline Diastolic BP - N'
   STDIAM='Final Diastolic BP - N'
   CSTDIAM='Change in Diastolic BP - N'
   MEANBST='Baseline Diastolic BP - Mean'
   MEANST='Final Diastolic BP - Mean'
   CMEANST='Change in Diastolic BP-Mean'
   STDBST='Baseline Diastolic BP - Std. Dev.'
   STDST='Final Diastolic BP - Std. Dev.'
   CSTDST='Change in Diastolic BP - Std. Dev.';
 TITLE1 'TABLE 8';
 TITLE2
    'PROC PRINT OF WORK.NEWMBP2';
 TITLE3 'SUMMARY REPORT';
RUN;

**** PROC TABULATE FOR WORK.MBP2 ****;
**** SUMMARY REPORT (TABLE 9) ****;

OPTIONS MISSING='0';

PROC TABULATE DATA=MBP2 NOSEPS;
 CLASS GENDER NRACE;
 VAR BSTDIAM STDIAM CSTDIAM;
 TABLE (NRACE ALL),GENDER*
     (BSTDIAM*(N*F=3. MEAN*F=6.2 STD*F=6.2)
      STDIAM*(N*F=3. MEAN*F=6.2 STD*F=6.2)
      CSTDIAM*(N*F=3. MEAN*F=6.2 STD*F=6.2))
      /RTS=15;
 KEYLABEL ALL='All'
          N='No.'
          MEAN='Mean'
          STD='Std Dev.';
 LABEL BSTDIAM='Baseline Diastolic BP'
       STDIAM='Final Diastolic BP'
          CSTDIAM='Change in Diastolic BP';
 FORMAT NRACE $RACE. GENDER $GENDER.;
 TITLE1 'TABLE 9';
 TITLE2
    'PROC TABULATE OUTPUT OF WORK.MBP2';
 TITLE3 'SUMMARY REPORT';
RUN;

**** PROC REPORT FOR WORK.NEWMBP ****;
**** SUMMARY REPORT (TABLE 10) ****;

PROC REPORT DATA=NEWMBP NOWD HEADSKIP
       HEADLINE SPACING=1;
 COLUMN NRACE (GENDER,
   (( 'Baseline/Diastolic BP'
   BSTDIAM BSTDIAM=MEANBST BSTDIAM=STDBST)
   ( 'Final/Diastolic BP'
   STDIAM STDIAM=MEANST STDIAM=STDST)
   ( 'Change in/Diastolic BP'
   CSTDIAM CSTDIAM=CMEANST CSTDIAM=CSTDST)));
  DEFINE NRACE/GROUP ORDER=INTERNAL WIDTH=6
       FORMAT=$RACE.;
  DEFINE GENDER/ACROSS FORMAT=$GENDER.
```

```
       SPACING=2 '_Gender_';
 DEFINE BSTDIAM/ANALYSIS N WIDTH=3 FORMAT=3.
     CENTER SPACING=3 'No.';
 DEFINE MEANBST/ANALYSIS MEAN WIDTH=8
       FORMAT=8.2 CENTER 'Mean';
 DEFINE STDBST/ANALYSIS STD WIDTH=6
       FORMAT=6.2 CENTER 'Std. Dev.';
 DEFINE STDIAM/N WIDTH=3 FORMAT=3.
     CENTER SPACING=3 'No.';
 DEFINE MEANST/MEAN WIDTH=8 FORMAT=8.2
       CENTER 'Mean';
 DEFINE STDST/ STD WIDTH=6 FORMAT=6.2
       CENTER 'Std. Dev.';
 DEFINE CSTDIAM/ANALYSIS N WIDTH=3 FORMAT=3.
     CENTER SPACING=3 'No.';
 DEFINE CMEANST/ANALYSIS MEAN WIDTH=8
       FORMAT=8.2 CENTER 'Mean';
 DEFINE CSTDST/ANALYSIS STD WIDTH=6
       FORMAT=6.2 CENTER 'Std. Dev.';

 BREAK AFTER NRACE/SKIP;

 RBREAK AFTER/ SKIP SUMMARIZE;

 COMPUTE AFTER;
  NRACE='All';
 ENDCOMP;
 TITLE1 'TABLE 10';
 TITLE2
    'PROC REPORT OUTPUT OF WORK.NEWMBP';
 TITLE3 'SUMMARY REPORT';
RUN;
```

CONCLUSION

This paper has attempted to demonstrate some of the procedures available in Base SAS for generating summaries and reports. PROCs PRINT, MEANS, UNIVARIATE, FREQ, TABULATE and REPORT are just some of the many ways to produce a report using SAS software. An additional procedure in Base SAS that can be used to generate reports is PROC SQL. This procedure was not covered in this paper due to time and space limitations, but should also be considered for summarizing and reporting data. Hopefully, this paper will help guide you on which Base SAS procedure will best produce the summary you desire.

REFERENCES

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APPENDIX

```
                                    TABLE 1
                        CONTENTS OF BTPAPER.MBP DATA SET

                              DATASETS PROCEDURE


                  -----Alphabetic List of Variables and Attributes-----

         #     Variable   Type    Len    Pos    Format      Label
        ───────────────────────────────────────────────────────────────────

         1     BSTDIAM    Num      8      0                 Baseline Diastolic BP
         6     CENTER     Num      8      32                Center
         3     GENDER     Char     3      16    $GENDER.    Gender
         4     NRACE      Char     5      19    $RACE.      Race
         5     PTNO       Num      8      24                Patient Number
         2     STDIAM     Num      8      8                 Final Diastolic BP
```

```
                                    TABLE 2
                      PROC FREQ OF BTPAPER.MBP - SUMMARY REPORT

                            TABLE OF GENDER BY NRACE

            GENDER(Gender)      NRACE(Race)

            Frequency│
            Percent  │
            Row Pct  │
            Col Pct  │ White  │ Black  │ Other  │  Total

            Female   │    44  │     7  │     2  │    53
                     │ 54.32  │  8.64  │  2.47  │ 65.43
                     │ 83.02  │ 13.21  │  3.77  │
                     │ 65.67  │ 63.64  │ 66.67  │
                     ──────────────────────────

            Male     │    23  │     4  │     1  │    28
                     │ 28.40  │  4.94  │  1.23  │ 34.57
                     │ 82.14  │ 14.29  │  3.57  │
                     │ 34.33  │ 36.36  │ 33.33  │
                     ──────────────────────────

            Total        67       11        3       81
                      82.72    13.58     3.70   100.00
```

```
                                    TABLE 3
                      PROC PRINT OF WORK.MBP2 - DETAIL REPORT

                                       Baseline     Final      Change in
         Patient                       Diastolic   Diastolic   Diastolic
         Number   Center   Race    Gender    BP         BP          BP

           71       3      Black   Female    103        91         -12
           72       3      Black   Female    100        99          -1
           73       3      Other   Female    104       103          -1
           74       3      Black   Male       99        97          -2
           75       3      White   Male       95        93          -2
           76       3      White   Female     93        86          -7
           77       3      White   Female    101        98          -3
           78       3      White   Female     95        91          -4
           79       3      White   Female     94        95           1
           80       3      White   Female     93        84          -9
           81       3      White   Female     93        95           2
```

```
                                    TABLE 4
                     PROC REPORT OF BTPAPER.MBP - DETAIL REPORT


                                            Baseline    Final    Change in
            Patient          Physician       Diastolic  Diastolic  Diastolic
            Number  Center    Name      Race    Gender    BP        BP        BP


              71      3     Dr. Wright  Black   Female    103       91        -12
              72      3     Dr. Wright  Black   Female    100       99         -1
              73      3     Dr. Wright  Other   Female    104      103         -1
              74      3     Dr. Wright  Black   Male       99       97         -2
              75      3     Dr. Wright  White   Male       95       93         -2
              76      3     Dr. Wright  White   Female     93       86         -7
              77      3     Dr. Wright  White   Female    101       98         -3
              78      3     Dr. Wright  White   Female     95       91         -4
              79      3     Dr. Wright  White   Female     94       95          1
              80      3     Dr. Wright  White   Female     93       84         -9
              81      3     Dr. Wright  White   Female     93       95          2
```

```
                                    TABLE 5
                    PROC PRINT OF WORK.MBP3 - DETAIL REPORT


                                        Baseline    Final    Change in
         Physician  Patient             Diastolic  Diastolic  Diastolic
 Center    Name     Number  Race  Gender   BP        BP        BP     Comment


   2     Dr. Jones    64    Black  Female   102       104        2     Baseline DBP > 90, increased
                      65    White  Female    84        95       11     Baseline DBP <= 90
                      66    White  Female    98       104        6     Baseline DBP > 90, increased
                      67    White  Female   107       106       -1     Baseline DBP > 90, decreased by 0% up to 5%
                      68    White  Female   102       104        2     Baseline DBP > 90, increased
                      69    White  Female    90        92        2     Baseline DBP <= 90


   3     Dr. Wright   70    White  Male      99        78      -21     Baseline DBP > 90, decreased by 10% or more
                      71    Black  Female   103        91      -12     Baseline DBP > 90, decreased by 10% or more
                      72    Black  Female   100        99       -1     Baseline DBP > 90, decreased by 0% up to 5%
                      73    Other  Female   104       103       -1     Baseline DBP > 90, decreased by 0% up to 5%
                      74    Black  Male      99        97       -2     Baseline DBP > 90, decreased by 0% up to 5%
                      75    White  Male      95        93       -2     Baseline DBP > 90, decreased by 0% up to 5%
                      76    White  Female    93        86       -7     Baseline DBP > 90, decreased by 5% up to 10%
                      77    White  Female   101        98       -3     Baseline DBP > 90, decreased by 0% up to 5%
                      78    White  Female    95        91       -4     Baseline DBP > 90, decreased by 0% up to 5%
                      79    White  Female    94        95        1     Baseline DBP > 90, increased
                      80    White  Female    93        84       -9     Baseline DBP > 90, decreased by 5% up to 10%
                      81    White  Female    93        95        2     Baseline DBP > 90, increased
```

```
                                       TABLE 6
                          PROC REPORT OF BTPAPER.MBP - DETAIL REPORT

                                            Baseline    Final     Change in
                  Physician   Patient       Diastolic  Diastolic  Diastolic
         Center      Name     Number   Race    Gender      BP         BP        BP        Comment
         _____

           3      Dr. Wright    70     White   Male        99         78       -21       Baseline DBP > 90,
                                                                                          decreased by 10% or more
                                71     Black   Female     103         91       -12       Baseline DBP > 90,
                                                                                          decreased by 10% or more
                                72     Black   Female     100         99        -1       Baseline DBP > 90,
                                                                                          decreased by 0% up to 5%
                                73     Other   Female     104        103        -1       Baseline DBP > 90,
                                                                                          decreased by 0% up to 5%
                                74     Black   Male        99         97        -2       Baseline DBP > 90,
                                                                                          decreased by 0% up to 5%
                                75     White   Male        95         93        -2       Baseline DBP > 90,
                                                                                          decreased by 0% up to 5%
                                76     White   Female      93         86        -7       Baseline DBP > 90,
                                                                                          decreased by 5% up to 10%
                                77     White   Female     101         98        -3       Baseline DBP > 90,
                                                                                          decreased by 0% up to 5%
                                78     White   Female      95         91        -4       Baseline DBP > 90,
                                                                                          decreased by 0% up to 5%
                                79     White   Female      94         95         1       Baseline DBP > 90,
                                                                                          increased
                                80     White   Female      93         84        -9       Baseline DBP > 90,
                                                                                          decreased by 5% up to 10%
                                81     White   Female      93         95         2       Baseline DBP > 90,
                                                                                          increased

         ------------------------------------------------------------------------------------------------------------
         |The average change in diastolic blood pressure for Dr. Wright was  -4.92 with an average % change of   -5.05 |
         ------------------------------------------------------------------------------------------------------------


         ============================================================================================================
         |The average change in diastolic blood pressure overall was  -2.26 with an average % change of  -2.35 |
         ============================================================================================================
```

```
                                       TABLE 7
                          PROC MEANS OF WORK.MBP - DETAIL REPORT

      GENDER  NRACE    N Obs  Variable  Label                    N      Mean     Std Dev    Minimum     Maximum
      ---------------------------------------------------------------------------------------------------------
      Female  White     44    BSTDIAM   Baseline Diastolic BP    44     94.70      5.52      83.00      107.00
                              STDIAM    Final Diastolic BP       44     92.73      8.00      74.00      109.00
                              CSTDIAM   Change in Diastolic BP   44     -1.98      6.32     -19.00       11.00

              Black      7    BSTDIAM   Baseline Diastolic BP     7    100.00      1.91      98.00      103.00
                              STDIAM    Final Diastolic BP        7     99.71      4.27      91.00      104.00
                              CSTDIAM   Change in Diastolic BP    7     -0.29      5.35     -12.00        3.00

              Other      2    BSTDIAM   Baseline Diastolic BP     2    101.00      4.24      98.00      104.00
                              STDIAM    Final Diastolic BP        2     96.50      9.19      90.00      103.00
                              CSTDIAM   Change in Diastolic BP    2     -4.50      4.95      -8.00       -1.00

      Male    White     23    BSTDIAM   Baseline Diastolic BP    23     97.13      6.57      85.00      108.00
                              STDIAM    Final Diastolic BP       23     93.91      9.23      73.00      110.00
                              CSTDIAM   Change in Diastolic BP   23     -3.22      6.79     -21.00       10.00

              Black      4    BSTDIAM   Baseline Diastolic BP     4     98.50      5.45      94.00      106.00
                              STDIAM    Final Diastolic BP        4     97.50      4.80      91.00      102.00
                              CSTDIAM   Change in Diastolic BP    4     -1.00      5.60      -6.00        7.00

              Other      1    BSTDIAM   Baseline Diastolic BP     1     97.00       .        97.00       97.00
                              STDIAM    Final Diastolic BP        1     90.00       .        90.00       90.00
                              CSTDIAM   Change in Diastolic BP    1     -7.00       .        -7.00       -7.00
      ---------------------------------------------------------------------------------------------------------
```

7

```
                                            TABLE 8
                                   PROC PRINT OF WORK.NEWMBP2
                                        SUMMARY REPORT

                  Baseline    Baseline     Baseline     Final      Final      Final     Change in   Change in    Change in
                  Diastolic   Diastolic   Diastolic BP  Diastolic  Diastolic  Diastolic BP Diastolic  Diastolic   Diastolic BP
Gender  Race  _TYPE_  BP - N   BP - Mean   - Std. Dev.   BP - N    BP - Mean  - Std. Dev.   BP - N     BP-Mean     - Std. Dev.

                 0       81       96.22        5.79         81       93.96       8.11         81        -2.26         6.24
        White    1       67       95.54        5.97         67       93.13       8.39         67        -2.40         6.46
        Black    1       11       99.45        3.42         11       98.91       4.37         11        -0.55         5.16
        Other    1        3       99.67        3.79          3       94.33       7.51          3        -5.33         3.79
Female           2       53       95.64        5.51         53       93.79       7.91         53        -1.85         6.12
Male             2       28       97.32        6.22         28       94.29       8.62         28        -3.04         6.50
Female  White    3       44       94.70        5.52         44       92.73       8.00         44        -1.98         6.32
Female  Black    3        7      100.00        1.91          7       99.71       4.27          7        -0.29         5.35
Female  Other    3        2      101.00        4.24          2       96.50       9.19          2        -4.50         4.95
Male    White    3       23       97.13        6.57         23       93.91       9.23         23        -3.22         6.79
Male    Black    3        4       98.50        5.45          4       97.50       4.80          4        -1.00         5.60
Male    Other    3        1       97.00          .           1       90.00         .           1        -7.00           .
```

```
                                            TABLE 9
                                PROC TABULATE OUTPUT OF WORK.MBP2
                                        SUMMARY REPORT
```

	Gender																	
	Female									Male								
	Baseline Diastolic BP			Final Diastolic BP			Change in Diastolic BP			Baseline Diastolic BP			Final Diastolic BP			Change in Diastolic BP		
	No.	Mean	Std Dev.	No.	Mean	Std Dev.	No.	Mean	Std Dev.	No.	Mean	Std Dev.	No.	Mean	Std Dev.	No.	Mean	Std Dev.
Race White	44	94.70	5.52	44	92.73	8.00	44	-1.98	6.32	23	97.13	6.57	23	93.91	9.23	23	-3.22	6.79
Black	7	100.00	1.91	7	99.71	4.27	7	-0.29	5.35	4	98.50	5.45	4	97.50	4.80	4	-1.00	5.60
Other	2	101.00	4.24	2	96.50	9.19	2	-4.50	4.95	1	97.00	0	1	90.00	0	1	-7.00	0
All	53	95.64	5.51	53	93.79	7.91	53	-1.85	6.12	28	97.32	6.22	28	94.29	8.62	28	-3.04	6.50

```
                                            TABLE 10
                                 PROC REPORT OUTPUT OF WORK.NEWMBP
                                         SUMMARY REPORT
```

	Gender																	
	Female									Male								
	Baseline Diastolic BP			Final Diastolic BP			Change in Diastolic BP			Baseline Diastolic BP			Final Diastolic BP			Change in Diastolic BP		
Race	No.	Mean	Std. Dev.	No.	Mean	Std. Dev.	No.	Mean	Std. Dev.	No.	Mean	Std. Dev.	No.	Mean	Std. Dev.	No.	Mean	Std. Dev.
White	44	94.70	5.52	44	92.73	8.00	44	-1.98	6.32	23	97.13	6.57	23	93.91	9.23	23	-3.22	6.79
Black	7	100.00	1.91	7	99.71	4.27	7	-0.29	5.35	4	98.50	5.45	4	97.50	4.80	4	-1.00	5.60
Other	2	101.00	4.24	2	96.50	9.19	2	-4.50	4.95	1	97.00	0	1	90.00	0	1	-7.00	0
All	53	95.64	5.51	53	93.79	7.91	53	-1.85	6.12	28	97.32	6.22	28	94.29	8.62	28	-3.04	6.50